

WORLD TAX INDEX: METHODOLOGY AND DATA

Igor Kotlán¹, Zuzana Machová²

Abstract

The article presents an indicator of tax burden that can be used as an alternative to tax quota, or implicit tax rates in macroeconomic analyses. It is called WTI – World Tax Index, which is an overall multi-criteria index that was constructed by authors on the basis of hard as well as soft data. The soft data expresses Qualified Expert Opinion that was gained through a large-scale questionnaire survey carried out among tax specialists from all OECD countries. The WTI consists of several sub-indices that deal with different groups of taxes, which are basically consistent with the classification according to the OECD. In the paper, values of WTI and its components for the period of 2005–2010 for all OECD countries are presented. Based on a comparison of the WTI with the tax quota, we found that the tax quota can be quite a good indicator of the real tax burden for some types of taxes. But we also show that the use of the tax quota for measuring the tax burden may be highly problematic in case of corporate taxation.

Keywords

World Tax Index (WTI), Tax Quota, Tax Burden, Qualified Expert Opinion (QEO), OECD Countries

I. Introduction

The tax burden is mostly measured using the tax quota or implicit tax rates. It is an indicator that relates tax revenues to a common basis. For the tax quota, it is the nominal GDP and for the implicit tax rates it is the activity burdened with the tax, such as capital, labour or consumption. Neither of these indicators can avoid the problem of using tax revenues as a tax burden approximator. Even the elementary Laffer Curve³ postulates, however, that such a link may not exist, or may not be directly proportional. Alternative indicators of the tax burden not based on other relevant criteria affecting the level of taxation seek to eliminate the aforementioned negatives of the tax quotas and implicit tax rates.

This paper presents a methodology for the construction of our own tax burden index, the World Tax Index (WTI), which combines hard and soft data. This article aims to describe the concept behind the construction of the WTI and its values over the period 2005–2010, both as a whole, as well as for its individual components affecting specific taxes. This

¹Faculty of Economics, VŠB – Technical University of Ostrava, Sokolská tř. 33, 701 21 Ostrava, Czech Republic.
E-mail: igor.kotlan@vsb.cz.

²Faculty of Economics, VŠB – Technical University of Ostrava, Sokolská tř. 33, 701 21 Ostrava, Czech Republic.
E-mail: zuzana.machova@vsb.cz.

³Laffer (2004).

includes the tax burden on corporate through income tax, the tax burden on individuals through income tax, value added tax, excise and property taxes. These taxes account for 95% of the tax mix in the selected OECD countries⁴.

The above mentioned index can be used in panel data regressions of various macroeconomic models much more efficiently than the tax quota. Time series can be shorter, but in respect to the data of 34 OECD members and 6 years of observation, the number 204 appears to be sufficient for reliable analysis.

II. Methods of measuring the tax burden

If we investigate in detail the methods of measuring the tax burden, we must necessarily start from the aforementioned tax quota, which, in its simplest form, represents the ratio of tax revenues to nominal GDP as a percentage. This is a macroeconomic indicator, which essentially says nothing about the tax burden of an individual economic entity, but given that the final tax bearer is an individual, it can be used with some degree of simplification to measure the tax burden.⁵ In fact, the tax ratio expresses the proportion of GDP redistributed through public budgets. This, however, has only an approximate character, as redistribution can be higher than indicated by the tax ratio as such due to other factors (especially deficit financing).

Although the tax burden, as explained below, has a number of disadvantages, it is becoming probably the most comprehensive and most used indicator due to significant differences in tax systems. The tax quota and thus the redistribution of GDP through public budgets approximately tripled in most countries in the past 100 years.

The categorization of the tax quota is an empirical rather than a theoretical issue. A breakdown according to the OECD methodology seems to be the most suitable.⁶ The definition of the tax quota and the compound tax quota or the analysis of the tax quota by type of tax is most widely used. Basically, the question is whether we include yields of closely or broadly defined tax in the numerator. Narrowly defined taxes mean tax payments which meet the tax attributes by having the word “tax” in their name. By broadly defined taxes we also refer to a tax payment which might not be a tax by name, but satisfies tax attributes (e.g., social security and health insurance). A simple tax quota under this definition means tax revenues to GDP and compound tax quota means the revenues from taxes and social security contributions in relation to GDP. One possible division is the definition of the tax quota by type of economic activity, i.e. determining whether the tax collection affects labour, capital or consumption. This tax revenue is then related to the GDP in %. An important categorizing factor will generally be the question as to which part of the public

⁴Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

⁵See e.g. Szarowska (2010), Johansson, Heady, Arnold, Brys, Vartia (2008), or Arnold (2008) for further reading on tax quota and its use in macroeconomic models.

⁶OECD (2011).

sector is the beneficiary of the tax collected, which determines the alternative definition of the tax quota. The tax quota by type of subcategories of the public sector can then be viewed as an indicator for the central or regional self-government level (for federations, the national and federal level can be further distinguished).

Generally, the basic advantage of the tax ratio lies in its complexity and simplicity, and thus good comparability. Also absent is the problem of simplifying and model assumptions, as is the case for alternative aggregates. The basic disadvantages are based on the principle of the structure itself. As mentioned previously, the tax quota determines the part of GDP that is redistributed through taxes, rather than the level of the tax burden. A higher tax ratio could mean improved efficiency in tax collection, rather than e.g. an increase in the tax burden. Conversely, it is highly likely that a lower tax burden can result in the elimination of tax evasion and increased tax ratio. The tax quota also excludes tax expenses, government regulation cost and disregards public debt. There are also problems with a time lag between the actual tax liability and the actual payment of taxes.

In today's globalized world, a lower effective tax burden (e.g. lower nominal rates) may also attract tax base from other countries, which disqualifies tax ratio as an approximation of the tax burden. It is also necessary to note a ratio figure in the denominator – GDP – methodological differences, the inclusion of undetected economy, etc.

Indicators of implicit tax rates are among the indicators that try to eliminate the above shortcomings concerning the use of indicators such as the tax ratio. This is an interesting alternative to the tax ratio, and therefore an index with a usable value added. This group of indices is very often used for European Union comparisons. Implicit tax rates do not relate tax collection to GDP as a base, but rather to commodities and activities affected (burdened) by each tax. In essence, it is an analysis of the impact of taxes on economic activities according to their function (consumption, labour, capital). Implicit tax rates thus express the actual, or effective, tax burden. The disadvantage of this type of indicator is that it says nothing about the real incidence of taxation, particularly with regard to the impact among individual sectors (consumption, labour, capital) and is basically determined by the forces of supply and demand, or factors influencing the tax incidence (elasticity of supply, demand, openness of economy, the time factor, or market structure).⁷

One example may be a relatively common situation whereby firms increase prices in response to higher corporate taxes. An increase in the tax burden on income or capital should be the statutory effect, but the real impact is on consumption (partial or full). Although implicit tax rates cannot take the above into account, they are a good tool when comparing the tax burden. For example, the implicit tax rate on consumption is determined by the share of the collection of consumption taxes (VAT, excise taxes, duties, etc.) to total final consumption of households, the implicit tax rate on labour is the share of labour taxes and public insurance (paid by the employee and the employer) to total labour costs and the implicit tax rate on capital is the share of revenues from capital taxes in relation to all potential taxable capital and corporate incomes.

⁷See e.g. Zechner, Swoboda (1986), or Walden (1996) for further reading on implicit tax rates.

III. WTI – construction methodology and determining the values

The World Tax Index (WTI) is an overall multi-criteria index of the tax burden created by the authors. As such, it has been designed primarily for the purpose of comparing the tax burden in OECD countries. The WTI is a mix of almost all OECD country taxes, except for those taxes that are so specific for individual economies that their comparison is virtually impossible.

Unlike indicators such as the tax quota, the WTI is not limited only to the assessment of tax revenues in relation to nominal GDP, but seeks to cover other aspects that may significantly affect the actual tax burden on economic entities in the countries surveyed. For example, it considers the issue of tax progression, administrative costs of taxation, tax credits, incentives, etc.

The WTI is, as already mentioned, a multi-criteria index. This means that it consists of several sub-indices. They deal with different groups of taxes, which are basically consistent with the classification according to the OECD.⁸ These indices also break down further into several sub-components which – including the further used designation – are shown in table (1).

Table 1 WTI sub-indices and their components

A) Corporate Income Tax (CIT)	D) Individual Property Taxes (PRO)
A1) Nominal Tax Rates	D1) Net Wealth Tax
A2) Progressivity	D2) Real Estate Tax
A3) Incentives	D3) Inheritance Tax
A4) Tax Deductibility of Costs	D4) Gift Tax
A5) Administration	D5) Other Property Taxes
B) Personal Income Tax (PIT)	E) Other Taxes on Consumption (OTC)
B1) Nominal Tax Rates	E1) Beer
B2) Progressivity Rate	E2) Wine
B3) Personal Deductions	E3) Alcohol
B4) Social Security Contributions	E4) Tobacco
B5) Administration	E5) Mineral Oils
C) Value Added Tax/Sales Tax (VAT)	
C1) Standard Tax Rate	
C2) Reduced Tax Rate	
C3) Registration Duty	
C4) Exemptions	

CIT is an index which assesses the tax burden on corporations, PIT is the burden from personal income taxes, including social security contributions. VAT is a sub-index representing the tax burden with regard to value added tax, or sales tax, PRO with regard to property taxes and OTC with regard to other taxes on consumption.

⁸OECD (2011).

The WTI is unique mainly because it is an indicator combining hard data from available sources with soft data expressing Qualified Expert Opinion (QEO). QEO was obtained through a large-scale questionnaire survey carried out among tax specialists⁹ from all OECD countries. In this survey, they expressed their opinions on how individual WTI components contribute to the tax burden in their home economies by distributing 100% among other sub-components based on importance with regard to the tax burden within each sub-index. A higher value meant a higher tax burden. The average percentage value that was assigned by experts in each country to a sub-component, expressed the weight of this sub-component, which became part of the next calculation.

As for the individual sub-indices, their weights in the WTI were also determined by tax experts; however, this time by using the Saaty method of pair-wise comparisons.¹⁰ The method is based on comparing all pairs of criteria with regard to the defined objective according to their importance. This way, the respondents compared all pairs of sub-indices with regard to their importance for the tax burden in the country. Yet again, higher importance meant a higher tax burden. Given that, for the expression of the importance in the paired comparison and for the subsequent calculation of weights, the Saaty method allows using the evaluation scale, a three-stage scale was used in this case.

Hard data was drawn primarily from the OECD databases, namely the OECD Tax Statistics and the OECD Tax Database. Additionally, World Bank data was used. Within its Doing Business project, the World Bank also tracks the aforementioned administrative difficulty of taxation.

Given that the hard data used for the calculation varied at different scales (e.g. the number of hours required for filing a tax declaration vs. a specific tax rate), it was necessary to perform their standardization, i.e. transforming the value from a closed interval from 0 to 1 according to the following formula:

$$X_s = \frac{X_i - X_{min}}{X_{max} - X_{min}}, \quad (1)$$

where X_s is the standardized value, X_i is the value for the i -th country, X_{min} is the minimum value and X_{max} the maximum value of the values from the countries covered. Zero was then assigned to the figure representing the lowest value before the standardization, and one was assigned to the highest value of all the values in the group before standardisation.

Individual sub-indices were calculated using the following formula:

$$S_k = \sum_{i=1}^N \left(X_{s_i} \frac{QEO_i}{100} \right), \quad (2)$$

where S_k is the value of the k -th sub-index, X_{s_i} is the standardized value of the i -th component of the sub-index and the QEO is weight resulting from the QEO for i -th component. N is the number of components of the sub-index.

⁹The respondents' selection criterion was the number of publications and citations related to the issue of taxation in Scopus or the recommendations of these authors.

¹⁰See e.g. Saaty (2008).

The summary index of WTI was then calculated by aggregating the 5 sub-indices as:

$$WTI = \sum_{k=1}^5 \left(S_k \frac{QEO_k}{100} \right), \quad (3)$$

where QEO_k is the weight defined on the basis of the QEO for the k -th sub-index.

Weights and their changes over time

Using the method described above, one can construct the WTI indicator for the specific period for which tax experts express the weight of individual sub-indices and their components. However, they may change over time. To make use of the WTI for a deeper macroeconomic analysis not limited to cross-country data, those changes need to be reflected in calculating the WTI.

As a result, tax experts did not only address the issue of the current tax burden from the perspective of individual sub-indices and their components during the survey. They also assessed the extent to which their importance changed on a fixed three-stage scale in the period 2005–2010. Their responses, involving changes in tax rates, i.e. the sub-components A1, B1, C1 and C2, were further confronted with the actual changes in these rates which occurred in the respective countries. On this basis, it was possible to quantify the average weight change which corresponds to one degree on the fixed three-stage scale over one year. After that, it was possible to re-calculate the weights for all reference years 2005–2010. The results show that the weight changes in such a short period of time are almost negligible. With this in mind, the weights of the main sub-indices were considered constant in the other calculations. Their values are summarized in table (2). For average weights of their individual sub-components in 2005–2010, see appendix (table A1).

Table 2 Weights of WTI sub-indices

	CIT	PIT	VAT	PRO	OTC
Australia	0.11	0.36	0.39	0.04	0.10
Austria	0.13	0.43	0.33	0.06	0.04
Belgium	0.08	0.43	0.22	0.18	0.10
Canada	0.10	0.56	0.18	0.12	0.04
Chile	0.05	0.23	0.54	0.07	0.11
Czech Republic	0.19	0.15	0.52	0.04	0.10
Denmark	0.10	0.60	0.22	0.03	0.05
Estonia	0.08	0.40	0.31	0.04	0.18
Finland	0.09	0.36	0.35	0.06	0.14
France	0.11	0.19	0.55	0.09	0.06
Germany	0.15	0.41	0.26	0.06	0.12
Greece	0.16	0.23	0.45	0.10	0.07
Hungary	0.12	0.31	0.47	0.03	0.07

Continued on next page

	CIT	PIT	VAT	PRO	OTC
Iceland	0.15	0.41	0.28	0.05	0.11
Ireland	0.15	0.52	0.22	0.05	0.05
Israel	0.08	0.31	0.46	0.07	0.08
Italy	0.15	0.50	0.20	0.09	0.06
Japan	0.38	0.31	0.11	0.09	0.11
Korea	0.44	0.17	0.23	0.07	0.08
Luxembourg	0.12	0.52	0.28	0.03	0.06
Mexico	0.23	0.23	0.38	0.06	0.11
Netherlands	0.12	0.33	0.44	0.06	0.06
New Zealand	0.14	0.48	0.26	0.06	0.06
Norway	0.16	0.28	0.44	0.04	0.09
Poland	0.09	0.17	0.50	0.04	0.21
Portugal	0.12	0.26	0.50	0.07	0.06
Slovak Republic	0.20	0.30	0.20	0.14	0.17
Slovenia	0.10	0.32	0.38	0.09	0.12
Spain	0.08	0.50	0.28	0.04	0.10
Sweden	0.07	0.54	0.28	0.03	0.09
Switzerland	0.08	0.54	0.24	0.05	0.09
Turkey	0.55	0.17	0.34	0.10	0.33
United Kingdom	0.04	0.33	0.44	0.06	0.14
United States	0.26	0.33	0.11	0.21	0.09

Approximation of values of the sub-indices' components

Described above are sources of data to determine the values of the individual components of WTI sub-indices. At this point, we shall discuss the specific data used to approximate these values.

In the case of the CIT (A), the following indicators were used:

- A1) combined corporate income tax rate,
- A2) tax rate for SMEs,
- A3) inflows of FDI as a percentage of GDP,
- A5) hours needed for paying taxes per year.

Due to the fact that no suitable indicator could be found for part A4 that would reflect the tax burden with regard to the possibility of tax deductible expenses in a sufficiently reliable and comparable form, this part was expressed as a combined CIT rate corrected for the appropriate weight obtained from the QEO.

The individual sub-components of the PIT, i.e. sub-index B, were expressed as:

- B1) net average personal tax,
- B2) multiple of the average wage when the top tax rate is applied,
- B3) sum of allowances and credits to gross average wage ratio,

- B4) average rate of employees' social security contributions,
 B5) hours needed for paying taxes per year.

All data except for B2 are related to a single person with no children and an average wage. As regards the sub-index, VAT (C) standard VAT rate, or sales tax in the case of the US, were used for the part C1. Parts C2 and C4 were aggregated into one indicator (as well as the respective weights), as in principle, they express the same thing. They were thus approximated by a reduced VAT rate corrected for the existence of items free of the tax duty, provided it is applied by the country. Part C3 was expressed as a threshold, from the time since the entity has been subject to VAT (in USD).

Given that, for property taxes, i.e. for sub-index PRO (D), it is practically impossible to find any other indicator reflecting the tax burden, and also especially because it is a sub-index of relatively small importance (see weights in table (1)), the tax quota indicators, i.e. the share of taxes in the GDP, were used for individual components in this case.

The last WTI sub-index is the OTC (E). In this case, the individual components were expressed in absolute amounts (in USD), which are paid out of a certain number of units of the commodity in each country.

In the event that, for some of the countries, the data for a particular year was not available, this value was replaced with the average for the country for the entire reference period. Where no data for any of the reference years was available, the values were determined for the country as the average of values of other countries surveyed. As stated above, all values entered into further calculations in a standardized form (see formula (1)), i.e. converted to the scale from zero to one. Average standardized values of all sub-component of each sub-index are shown in the table in appendix (table A2). The following table (3) shows the average standardized values of the main sub-indices for the period 2005–2010.

Table 3 Average standardized values of WTI sub-indices (2005–2010)

	CIT (A)	PIT (B)	VAT (C)	PRO (D)	OTC (E)
Australia	0.48	0.40	0.17	0.01	0.27
Austria	0.45	0.53	0.65	0.02	0.17
Belgium	0.42	0.67	0.60	0.90	0.17
Canada	0.60	0.44	0.06	0.00	0.14
Chile	0.41	0.48	0.66	0.10	0.23
Czech Republic	0.44	0.50	0.34	0.01	0.22
Denmark	0.57	0.51	0.96	0.31	0.07
Estonia	0.47	0.38	0.38	0.00	0.13
Finland	0.54	0.56	0.50	0.44	0.18
France	0.70	0.63	0.48	0.38	0.05
Germany	0.70	0.67	0.41	0.27	0.26
Greece	0.51	0.43	0.35	0.20	0.08
Hungary	0.32	0.73	0.57	0.06	0.21
Iceland	0.20	0.56	0.57	0.18	0.34

Continued on next page

	CIT (A)	PIT (B)	VAT (C)	PRO (D)	OTC (E)
Ireland	0.10	0.27	0.37	0.16	0.35
Israel	0.53	0.41	0.58	0.00	0.27
Italy	0.61	0.54	0.55	0.16	0.16
Japan	0.94	0.41	0.04	0.42	0.19
Korea	0.51	0.27	0.26	0.32	0.27
Luxembourg	0.35	0.53	0.36	0.22	0.08
Mexico	0.64	0.28	0.43	0.00	0.04
Netherlands	0.59	0.75	0.43	0.46	0.37
New Zealand	0.52	0.35	0.32	0.00	0.20
Norway	0.45	0.34	0.86	0.18	0.82
Poland	0.35	0.69	0.36	0.04	0.17
Portugal	0.49	0.35	0.57	0.01	0.18
Slovak Republic	0.33	0.46	0.59	0.00	0.28
Slovenia	0.42	0.70	0.56	0.04	0.17
Spain	0.71	0.34	0.33	0.31	0.13
Sweden	0.62	0.34	0.66	0.01	0.24
Switzerland	0.35	0.32	0.10	0.42	0.17
Turkey	0.74	0.60	0.72	0.02	0.61
United Kingdom	0.50	0.58	0.08	0.20	0.42
United States	0.63	0.45	0.08	0.27	0.12

IV. The resulting values of WTI and its sub-indices

The resulting values¹¹ of each sub-index and the WTI as a whole were obtained by substituting standardized values into the formulas (2) and (3). These values are shown in table (4).

Table (4) always shows average values of WTI and its sub-indices for 2005–2010. Each indicator ranges on a scale from 0 to 1, where 0 is minimum tax burden and 1 maximum tax burden on businesses. With regard to this index, the lowest tax burden was found in Ireland, Switzerland and Australia, where the WTI does not exceed 0.3. They are followed by countries such as Canada, the United Kingdom, Estonia, and also the Czech Republic, where the WTI value is 0.36. On the other hand, the highest tax burden was shown in Turkey, Belgium, Norway, Denmark and the Netherlands. If we look more closely at the figures for individual sub-indices, it is clear that Turkey's high tax burden is caused by high burden on corporations, while in other countries it is a burden on individuals through income taxes or burden with regard to VAT. The tables (A1 and A2) listed in appendix then allow tracing in detail the differences in the figures achieved based on the sub-indices broken down into their sub-component.

¹¹ All the data is available at www.worldtaxindex.com.

Table 4 Average values of WTI and its sub-indices for 2005–2010

	WTI	CIT (A)	PIT (B)	VAT (C)	PRO (D)	OTC (E)
Australia	0.29	0.05	0.14	0.07	0.00	0.03
Austria	0.51	0.06	0.23	0.22	0.00	0.01
Belgium	0.63	0.03	0.29	0.13	0.16	0.02
Canada	0.32	0.06	0.25	0.01	0.00	0.01
Chile	0.52	0.02	0.11	0.35	0.01	0.03
Czech Republic	0.36	0.08	0.08	0.18	0.00	0.02
Denmark	0.58	0.05	0.30	0.21	0.01	0.00
Estonia	0.33	0.04	0.15	0.12	0.00	0.02
Finland	0.48	0.05	0.20	0.18	0.02	0.02
France	0.50	0.08	0.12	0.27	0.03	0.00
Germany	0.53	0.11	0.27	0.10	0.02	0.03
Greece	0.36	0.08	0.10	0.15	0.02	0.01
Hungary	0.54	0.04	0.22	0.27	0.00	0.01
Iceland	0.46	0.03	0.23	0.16	0.01	0.04
Ireland	0.26	0.01	0.14	0.08	0.01	0.02
Israel	0.46	0.04	0.13	0.27	0.00	0.02
Italy	0.49	0.09	0.27	0.11	0.01	0.01
Japan	0.55	0.36	0.12	0.00	0.04	0.02
Korea	0.38	0.22	0.05	0.06	0.02	0.02
Luxembourg	0.43	0.04	0.27	0.10	0.01	0.00
Mexico	0.38	0.14	0.06	0.16	0.00	0.00
Netherlands	0.55	0.07	0.25	0.19	0.03	0.02
New Zealand	0.34	0.07	0.17	0.08	0.00	0.01
Norway	0.62	0.07	0.10	0.37	0.01	0.07
Poland	0.36	0.03	0.12	0.18	0.00	0.04
Portugal	0.44	0.06	0.09	0.28	0.00	0.01
Slovak Republic	0.37	0.07	0.14	0.12	0.00	0.05
Slovenia	0.50	0.04	0.22	0.21	0.00	0.02
Spain	0.35	0.06	0.17	0.09	0.01	0.01
Sweden	0.43	0.04	0.18	0.18	0.00	0.02
Switzerland	0.26	0.03	0.17	0.02	0.02	0.02
Turkey	0.96	0.41	0.10	0.24	0.00	0.20
United Kingdom	0.31	0.02	0.19	0.03	0.01	0.06
United States	0.39	0.16	0.15	0.01	0.06	0.01

V. Comparison of the WTI and tax quota

The comparison of the tax quota, including its components and the WTI and its various sub-components was performed by using the simple Spearman's rank correlation coefficient, which is based on the search for correlations in the ranks of individual countries for the tax quota and the alternative WTI index. Table (5) shows the results at conven-

tional levels of significance (1% and 5%). The overall WTI index is 41.4% correlated with the tax quota. In contrast, the sub-index CIT is virtually uncorrelated to the tax quota (compared with the OECD classification 1200). Moreover, the correlation was statistically non-significant in that case.

Table 5 Spearman's correlation coefficient (rs) with a tax quota for the WTI and its sub-indices

	WTI	CIT	PIT	VAT	PRO	OTC
r_s (%)	41,4*	-0.5	64,5**	55,8**	47,4**	36,1*

Note: * Statistically significant at 5% significance level, ** statistically significant at 1% significance level.

The most obvious correlation can be found for the sub-index PIT to the tax quota of personal income tax and social security contributions (OECD classification 1100 and 2000) and the VAT index with the OECD classification 5120.

Especially for the corporate tax burden, the tax quota as an indicator of tax burden fails and is not usable in macroeconomic models in regression analyses.

VI. Conclusion

The aim of the paper was to present an alternative to measuring tax burden – an index of the authors' own making, the World Tax Index (WTI). In particular, it presents the methodology for its construction and its value over the period 2005–2010 in 34 OECD countries. This index is described in summary as well as for each of its components.

The methodology of the construction is built on soft and hard data. Soft data includes experts' opinions related to tax issues, who were selected according to their publishing activities from Scopus or based on the recommendations of these authors. On the basis of questionnaires they completed, using the method of pair-wise comparisons, the weights of individual taxes in the whole tax index were constructed, as well as the weights of individual components of specific taxes. This served as a basis for determining the importance of these components of hard data in the tax index. The essence of almost all sub-indices of individual taxes was the nominal (statutory) rate. For personal and corporate income taxes, this further included in particular their progression, administrative costs of tax collection, tax deductible expenses (corporate tax) or tax credits (personal tax). Social security contributions also represent a very important part of personal income tax. For the value added tax, the issue was in particular the basic and reduced rate and the registration duty. Selective excise taxes were then represented by typical individual taxes according to the OECD classification and property taxes comprised mainly the real estate, inheritance and gift taxes.

Based on a comparison of the World Tax Index with the tax quota, we found that the tax quota can be quite a good indicator of the real tax burden for some types of taxes (mainly personal income tax, including social security contributions, or VAT). However, it appears to be highly problematic primarily for corporate taxes, where it was shown that there is no clear correlation between the effective tax burden as measured by the CIT and tax

revenues to nominal GDP, which is represented by the tax quota. The use of the tax quota for measuring the tax burden, especially in corporate taxes is therefore highly problematic, which is an object of authors' further research.

References

- Arnold, J. (2008). Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from a Panel of OECD Countries. *OECD Economics Department Working Papers*, 643.
- Johansson, A., Heady, C., Arnold, J., Brys, B., Vartia, L. (2008). Tax and Economic Growth. *OECD Economics Department Working Papers*, 621.
- Laffer, A. B. (2004). The Laffer Curve: Past, Present, and Future. *Heritage Foundation Backgrounder*, 1765.
- OECD (2011). *Revenue Statistics 1965–2010: 2011 Edition*. Paris: OECD.
- Saaty, T. L. (2008). Decision Making with the Analytic Hierarchy Process. *International Journal of Services Sciences*, 1(1), 83–98.
- Szarowska, I. (2010). Changes in Taxation and their Impact on Economic Growth in the European Union. *MPRA Paper*, 32354.
- Walden, M. L. (1996). Implicit Tax Rates of the Expanded Earned Income Tax Credit for Welfare Recipients in North Carolina. *Journal of Consumer Affairs*, 30(2), 348–372.
- Zechner, J., Swoboda, P. (1986). The Critical Implicit Tax Rate and Capital Structure. *Journal of Banking & Finance*, 10(3), 327–341.

Appendix

Table A1 Average weights of sub-indices' components (2005–2010)

	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
Australia	0,40	0,10	0,13	0,04	0,20	0,50	0,18	0,13	0,03	0,16
Austria	0,59	0,00	0,16	0,19	0,06	0,29	0,25	0,13	0,22	0,06
Belgium	0,31	0,05	0,21	0,21	0,08	0,47	0,15	0,13	0,15	0,03
Canada	0,45	0,09	0,21	0,23	0,07	0,45	0,30	0,13	0,13	0,05
Chile	0,35	0,10	0,24	0,10	0,13	0,36	0,30	0,00	0,15	0,12
Czech Republic	0,32	0,07	0,14	0,37	0,12	0,40	0,11	0,19	0,27	0,10
Denmark	0,73	0,02	0,12	0,42	−0,01	0,29	0,56	0,21	0,05	0,01
Estonia	0,64	0,00	0,38	0,12	0,03	0,66	0,00	0,14	0,23	0,04
Finland	0,64	0,10	0,13	0,18	0,15	0,71	0,28	0,01	0,10	0,10
France	0,73	0,06	0,07	0,07	0,03	0,60	0,15	0,12	0,24	0,03
Germany	0,61	0,03	0,15	0,18	0,04	0,25	0,20	0,15	0,24	0,05
Greece	0,37	0,08	0,17	0,08	0,23	0,20	0,19	0,21	0,16	0,05
Hungary	0,33	0,10	0,15	0,22	0,15	0,28	0,18	0,10	0,49	0,12
Iceland	0,44	0,07	0,15	0,14	0,08	0,73	0,04	0,18	0,04	0,08
Ireland	0,73	0,04	0,12	0,06	0,08	0,22	0,16	0,14	0,10	0,09
Israel	0,34	0,17	0,21	0,11	0,07	0,48	0,26	0,14	0,13	0,04
Italy	0,51	0,05	0,10	0,23	0,23	0,48	0,18	0,12	0,14	0,11
Japan	0,76	0,05	0,12	0,05	0,07	0,27	0,14	0,19	0,24	0,10

Continued on next page

	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
Korea	0,55	0,12	0,17	0,05	0,09	0,47	0,14	0,26	0,08	0,06
Luxembourg	0,40	0,00	0,15	0,30	0,15	0,30	0,20	0,35	0,10	0,05
Mexico	0,25	0,18	0,26	0,14	0,14	0,28	0,20	0,15	0,16	0,16
Netherlands	0,33	0,03	0,33	0,28	0,08	0,26	0,15	0,48	0,10	0,03
New Zealand	0,63	0,00	0,05	0,17	0,10	0,75	0,23	0,04	0,01	0,09
Norway	0,41	0,10	0,14	0,05	0,05	0,41	0,28	0,07	0,00	0,05
Poland	0,45	0,05	0,16	0,14	0,13	0,27	0,14	0,10	0,41	0,16
Portugal	0,45	0,08	0,09	0,18	0,24	0,15	0,22	0,14	0,17	0,06
Slovak Republic	0,48	0,03	0,10	0,18	0,30	0,32	0,02	0,16	0,36	0,07
Slovenia	0,58	0,03	0,15	0,18	0,13	0,60	0,18	0,12	0,13	0,10
Spain	0,48	0,15	0,22	0,12	0,12	0,34	0,27	0,17	0,10	0,06
Sweden	0,62	0,07	0,26	0,06	0,03	0,36	0,36	0,09	0,04	0,02
Switzerland	0,53	0,03	0,17	0,22	0,04	0,37	0,23	0,15	0,16	0,07
Turkey	0,16	0,00	0,24	0,40	0,24	0,10	0,10	0,43	0,16	0,24
United Kingdom	0,39	0,00	0,12	0,38	0,15	0,83	0,04	0,08	0,08	0,05
United States	0,28	0,06	0,20	0,20	0,09	0,22	0,13	0,27	0,17	0,05

	C1	C3	C2+4	D1	D2+3+4	D5	E1	E2	E3	E4	E5
Australia	0,25	0,05	0,47	0,00	0,20	0,75	0,15	0,15	0,15	0,15	0,31
Austria	0,63	0,03	0,35	0,00	0,26	0,47	0,07	0,01	0,06	0,16	0,61
Belgium	0,60	0,05	0,30	0,00	0,90	0,10	0,07	0,07	0,08	0,12	0,39
Canada	0,82	0,02	0,27	0,02	0,97	0,02	0,11	0,11	0,11	0,29	0,27
Chile	0,44	0,12	0,28	0,00	0,94	0,00	0,08	0,08	0,10	0,36	0,24
Czech Republic	0,29	0,12	0,27	0,00	0,48	0,30	0,06	0,02	0,08	0,17	0,42
Denmark	0,85	0,05	0,10	0,00	0,83	0,17	0,18	0,18	0,14	-0,10	0,18
Estonia	0,46	0,02	0,20	0,03	0,60	0,21	0,06	0,10	0,12	0,03	0,23
Finland	0,22	0,13	0,56	0,00	0,96	0,00	0,09	0,08	0,08	0,10	0,23
France	0,63	0,04	0,16	0,42	0,47	0,08	0,33	0,12	0,09	0,24	0,04
Germany	0,40	0,05	0,35	0,00	0,93	0,03	0,04	0,01	0,06	0,21	0,42
Greece	0,35	0,03	0,25	0,27	0,39	0,13	0,07	0,07	0,07	0,13	0,30
Hungary	0,34	0,23	0,35	0,14	0,69	0,17	0,20	0,20	0,15	0,25	0,20
Iceland	0,50	0,05	0,32	0,04	1,01	0,05	0,15	0,15	0,15	0,18	0,37
Ireland	0,28	0,09	0,52	0,08	0,57	0,25	0,15	0,15	0,10	0,20	0,15
Israel	0,60	0,13	0,18	0,08	0,72	0,20	0,10	0,07	0,12	0,14	0,47
Italy	0,44	0,18	0,36	0,13	0,66	0,19	0,11	0,14	0,13	0,18	0,39
Japan	0,77	0,06	0,19	0,03	0,88	0,10	0,20	0,16	0,16	0,20	0,13
Korea	0,63	0,06	0,36	0,00	0,78	0,22	0,09	0,04	0,13	0,37	0,29
Luxembourg	0,50	0,05	0,45	0,00	0,99	0,01	0,20	0,20	0,20	0,20	0,20
Mexico	0,41	0,08	0,52	0,28	0,52	0,17	0,08	0,06	0,09	0,24	0,31
Netherlands	0,30	0,08	0,63	0,15	0,87	0,00	0,03	0,03	0,03	0,38	0,55
New Zealand	0,80	0,00	0,09	0,00	0,78	0,12	0,08	0,08	0,23	0,22	0,30
Norway	0,80	0,00	0,20	0,20	0,80	0,00	0,06	0,18	0,43	0,20	0,10
Poland	0,29	0,09	0,49	0,00	0,83	0,18	0,10	0,08	0,14	0,14	0,40
Portugal	0,43	0,09	0,42	0,28	0,35	0,08	0,08	0,08	0,23	0,24	0,19

Continued on next page

	C1	C3	C2+4	D1	D2+3+4	D5	E1	E2	E3	E4	E5
Slovak Republic	0,60	0,18	0,23	0,05	0,34	0,42	0,13	0,10	0,13	0,18	0,34
Slovenia	0,40	0,20	0,34	0,00	0,98	0,02	0,00	0,00	0,24	0,16	0,48
Spain	0,33	0,11	0,38	0,09	0,73	0,11	0,08	0,03	0,11	0,27	0,40
Sweden	0,52	0,07	0,34	0,00	0,90	0,12	0,10	0,08	0,08	0,08	0,45
Switzerland	0,50	0,09	0,40	0,26	0,65	0,05	0,08	0,12	0,15	0,17	0,39
Turkey	0,85	0,24	0,10	0,00	0,82	0,28	0,08	0,16	0,16	0,08	0,32
United Kingdom	0,13	0,00	0,33	0,10	0,53	0,19	0,09	0,09	0,09	0,18	0,44
United States	0,50	0,08	0,33	0,02	0,78	0,12	0,13	0,13	0,13	0,28	0,22

Note: The data is available at www.worldtaxindex.com

Table A2 Average standardized values of sub-indices' components (2005–2010)

	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
Australia	0,65	0,87	0,89	0,06	0,06	0,47	0,13	1,00	0,00	0,06
Austria	0,46	0,69	0,90	0,11	0,15	0,75	0,10	0,77	0,82	0,15
Belgium	0,79	0,67	0,43	0,22	0,13	1,00	0,05	0,76	0,63	0,13
Canada	0,73	0,41	0,90	0,17	0,08	0,48	0,15	0,95	0,33	0,08
Chile	0,17	0,42	0,76	0,06	1,00	0,05	1,00	0,00	0,32	1,00
Czech Republic	0,36	0,59	0,84	0,38	0,10	0,48	0,05	0,80	0,54	0,10
Denmark	0,50	0,72	0,91	0,17	0,03	0,95	0,05	0,88	0,49	0,03
Estonia	0,35	0,58	0,60	0,06	0,27	0,37	0,00	0,80	0,06	0,27
Finland	0,50	0,73	0,91	0,11	0,10	0,67	0,09	0,92	0,30	0,10
France	0,81	0,35	0,92	0,04	0,18	0,62	0,15	0,68	0,62	0,18
Germany	0,82	1,00	0,96	0,11	0,25	0,98	0,25	0,90	0,95	0,25
Greece	0,52	0,74	0,98	0,05	0,37	0,37	0,20	0,84	0,72	0,37
Hungary	0,23	0,28	0,88	0,10	0,34	0,83	0,04	0,98	0,72	0,34
Iceland	0,17	0,41	0,59	0,04	0,11	0,53	0,03	0,85	0,01	0,11
Ireland	0,00	0,26	0,68	0,00	0,02	0,43	0,08	0,91	0,27	0,02
Israel	0,60	0,81	0,87	0,07	0,23	0,36	0,22	0,95	0,35	0,23
Italy	0,66	0,86	0,97	0,19	0,36	0,64	0,19	0,83	0,42	0,36
Japan	1,00	0,78	0,99	0,03	0,37	0,39	0,25	0,49	0,56	0,37
Korea	0,51	0,29	0,99	0,02	0,28	0,16	0,18	0,48	0,34	0,28
Luxembourg	0,63	0,78	0,12	0,26	0,00	0,58	0,04	0,85	0,54	0,00
Mexico	0,60	0,82	0,92	0,13	0,62	0,00	0,17	0,92	0,06	0,62
Netherlands	0,54	0,58	0,80	0,40	0,20	0,73	0,06	0,98	0,80	0,20
New Zealand	0,70	0,91	0,94	0,09	0,15	0,38	0,07	1,00	0,00	0,15
Norway	0,57	0,80	0,91	0,01	0,04	0,64	0,09	0,76	0,35	0,04
Poland	0,24	0,48	0,89	0,09	0,47	0,57	0,16	0,75	0,89	0,47
Portugal	0,53	0,75	0,95	0,12	0,36	0,47	0,29	0,76	0,50	0,36
Slovak Republic	0,24	0,48	0,87	0,09	0,33	0,45	0,02	0,45	0,61	0,33
Slovenia	0,38	0,60	0,94	0,06	0,27	0,77	0,07	0,59	1,00	0,27
Spain	0,72	0,74	0,92	0,13	0,28	0,41	0,13	0,73	0,29	0,28
Sweden	0,55	0,77	0,84	0,02	0,08	0,61	0,07	0,89	0,32	0,08
Switzerland	0,32	0,56	0,82	0,10	0,01	0,29	0,19	0,81	0,27	0,01
Turkey	0,34	0,00	0,93	1,00	0,23	0,64	0,19	0,83	0,68	0,23

Continued on next page

	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
United Kingdom	0,61	0,53	0,84	0,40	0,06	0,57	0,09	0,80	0,42	0,06
United States	0,99	0,52	0,95	0,51	0,28	0,49	0,50	0,77	0,35	0,28

	C1	C3	C2+4	D1	D2+3+4	D5	E1	E2	E3	E4	E5
Australia	0,25	0,54	0,17	0,00	0,00	0,01	0,14	0,18	0,28	0,99	0,10
Austria	0,75	0,68	0,47	0,00	0,07	0,01	0,04	0,00	0,10	0,14	0,22
Belgium	0,80	0,96	0,23	0,03	1,00	0,03	0,04	0,10	0,23	0,08	0,34
Canada	0,04	0,79	0,05	0,08	0,00	0,01	0,14	0,10	0,06	0,32	0,05
Chile	0,70	0,66	1,00	0,00	0,11	0,01	0,14	0,18	0,28	0,31	0,28
Czech Republic	0,71	0,36	0,30	0,00	0,02	0,01	0,03	0,00	0,22	0,16	0,43
Denmark	1,00	0,96	0,62	0,00	0,37	0,01	0,05	0,14	0,20	0,36	0,23
Estonia	0,68	0,76	0,25	0,00	0,00	0,01	0,14	0,18	0,28	0,31	0,28
Finland	0,85	0,93	0,34	0,01	0,46	0,01	0,19	0,53	0,52	0,07	0,32
France	0,73	0,16	0,10	0,10	0,72	0,01	0,02	0,01	0,17	0,04	0,34
Germany	0,65	0,81	0,29	0,00	0,29	0,01	0,02	0,00	0,16	0,46	0,36
Greece	0,69	0,89	0,29	0,03	0,15	1,00	0,04	0,00	0,20	0,03	0,20
Hungary	0,83	0,68	0,37	0,04	0,08	0,01	0,08	0,00	0,20	0,29	0,45
Iceland	0,98	0,95	0,08	0,02	0,18	0,17	0,34	0,77	0,00	0,40	0,28
Ireland	0,80	0,26	0,24	0,00	0,29	0,01	0,16	0,56	0,58	0,75	0,20
Israel	0,55	0,86	0,82	0,00	0,00	0,01	1,00	0,00	0,28	0,06	0,28
Italy	0,75	0,67	0,29	0,00	0,03	0,72	0,06	0,00	0,07	0,04	0,34
Japan	0,00	0,21	0,17	0,00	0,47	0,01	0,14	0,13	0,28	0,34	0,18
Korea	0,25	0,76	0,17	0,00	0,41	0,01	0,14	0,18	0,28	0,18	0,52
Luxembourg	0,50	0,92	0,14	1,00	0,22	0,01	0,02	0,00	0,09	0,08	0,22
Mexico	0,51	0,66	0,32	0,00	0,00	0,01	0,00	0,18	0,28	0,00	0,00
Netherlands	0,70	1,00	0,23	0,00	0,53	0,01	0,05	0,13	0,19	0,38	0,39
New Zealand	0,37	0,65	0,25	0,00	0,00	0,01	0,14	0,18	0,28	0,31	0,13
Norway	1,00	0,96	0,31	0,27	0,16	0,01	0,14	1,00	0,97	1,00	0,25
Poland	0,85	0,30	0,17	0,00	0,04	0,01	0,07	0,16	0,32	0,24	0,18
Portugal	0,76	0,88	0,39	0,00	0,03	0,01	0,14	0,00	0,16	0,46	0,13
Slovak Republic	0,70	0,18	0,63	0,00	0,00	0,01	0,06	0,00	0,24	0,46	0,48
Slovenia	0,75	0,66	0,38	0,00	0,04	0,01	0,08	0,00	0,08	0,12	0,28
Spain	0,55	0,66	0,21	0,06	0,42	0,07	0,14	0,00	0,09	0,03	0,25
Sweden	1,00	0,98	0,23	0,03	0,01	0,01	0,14	0,45	0,77	0,15	0,26
Switzerland	0,13	0,43	0,00	0,61	0,41	0,01	0,14	0,00	0,21	0,29	0,19
Turkey	0,65	0,66	0,14	0,00	0,03	0,01	0,28	0,39	1,00	0,64	1,00
United Kingdom	0,60	0,00	0,02	0,00	0,37	0,01	0,19	0,47	0,44	0,78	0,41
United States	0,03	0,66	0,04	0,00	0,35	0,01	0,16	0,09	0,06	0,31	0,00

Note: The data is available at www.worldtaxindex.com